Ground Water Protection in Virginia

2003 Annual Report of the Ground Water Protection Steering Committee

Virginia to Embark on a Significant Water Supply Planning Effort

There is nothing like a severe drought to focus attention and effort on water resources issues! Virginia experienced substantial water supply impacts due to the recent drought that began in 1999 and peaked in late summer of 2002. By the third week in August of 2002 several large and small public water supplies across the Commonwealth were poised on the brink of imminent failure. Charlottesville and Portsmouth had less than sixty days of available water supply remaining in reservoirs. Levels in the Rapidan River dropped below the water intake for the Town of Orange. The Town of Farmville relied on a release of water from a recreational lake at Holiday Lake State Park to raise water levels in the Appomattox River to a point where water could be withdrawn. Many ground water-supplied public water systems reported significant reductions in well yields. More than 6,000 private water wells failed between July and October of 2002.

Governor Warner issued Executive Order #33 restricting non-essential outdoor water use over much of the State on August 30, 2002. The full text of this order can be found at http://www.governor.virginia.gov/Press_Policy/Executive_Orders/pdf/EO_33.pdf. On December 13, 2002 Governor Warner issued the Virginia Water Supply Initiative (Executive Order #39, http://www.governor.virginia.gov/Press_Policy/Executive_Orders/pdf/EO_39.pdf). This order requires the Secretaries of Commerce and Trade, Health and Human Resources, and Natural Resources to initiate several actions to help insure that the citizens

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The Year in Review

2002-2003 Year in Review

What a year it has been for those of us working on ground water issues! It is safe to say that few years have seen so much attention paid to ground water supply and so much activity devoted to water and water supply planning in general.

As this issue arrives in Fall 2003, it may be difficult to remember the impact of the multi-year drought on private residences, businesses, and local and state officials. Many Steering Committee members were busy responding to emergencies, giving technical assistance to people affected by the drought, and leading planning efforts.

Agriculture was hard hit, with the U.S. Secretary of Agriculture approving

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Agricultural Stewardship Act Program

Background and Overview

The Virginia General Assembly passed the Agricultural Stewardship Act (ASA) in 1996. The program created by the ASA was fully implemented effective April 1, 1997. The responsibility for the administration and enforcement of the ASA was given to the Commissioner of the Virginia Department of Agriculture and Consumer Services (VDACS). Through an effort of cooperation and coordination involving Virginia's Soil and Water Conservation Districts (SWCD), VDACS, and the agricultural community, the ASA program offers a common-sense solution to water pollution problems caused by agricultural operations.

How the Program Works

Complaints alleging that a specific agricultural activity is causing or will cause water pollution go to the Commissioner of VDACS. If a complaint meets the criteria for investigation, the Commissioner's Office contacts the appropriate SWCD about investigating the problem. If the district declines, the Commissioner's Office conducts the investigation.

The purpose of the investigation is to determine whether the agricultural activity is causing or will cause water pollution. If no causal link is found, the Commissioner will dismiss the complaint. If the investigation determines that the activity is the cause, the farmer is given sixty days to develop a corrective plan. The local SWCD then reviews the plan and when it meets the necessary requirements to solve the water pollution problem, the Commissioner approves it.

From the time the Commissioner determines that a complaint is founded, the ASA gives the farmer six months to start implementing his plan and up to eighteen months for full implementation. The timing allows the farmer to take advantage of suitable weather conditions for outside work or construction required. If a farmer fails to implement a plan within the 18-month time limit, the ASA requires the Commissioner to take enforcement action.

Summary of Complaints

During April 1, 2002 through March 31, 2003—the sixth year of the Agricultural Stewardship program—the Commissioner received more than 200 inquiries regarding possible agricultural pollution, of which 41 became official complaints. Official complaints fell into nine different categories according to commodity produced or raised: beef - 15; cropland – 7; dairy - 7; horse - 4; poultry - 3; beef/horse - 2; beef/hog - 1; hog - 1; and other - 1.

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of the Commonwealth have access to an adequate supply of clean, safe drinking water. One action required was the development of a drought assessment and response plan for the Commonwealth.

A Drought Response Technical Advisory Committee was convened in February of 2003. The committee was composed of representatives of State and Federal agencies, local governments, agricultural interests, irrigation interests, the car wash industry, environmental interests, manufacturing interests, golf courses and other interested parties. The committee completed a draft drought response plan in late March of 2003. The draft drought response plan as well as meeting summaries and committee membership can be found at http://www.deq.state.va.us/info/droughttac.html.

The 2003 session of the Virginia General Assembly passed Senate bill 1221 requiring the Department of Environmental Quality to initiate a significant water supply planning effort in the Commonwealth. The bill specifically requires that the Department convene a committee of interested parties and develop draft criteria required in local and regional water supply plans and produce a preliminary state water resources plan by December 2003.

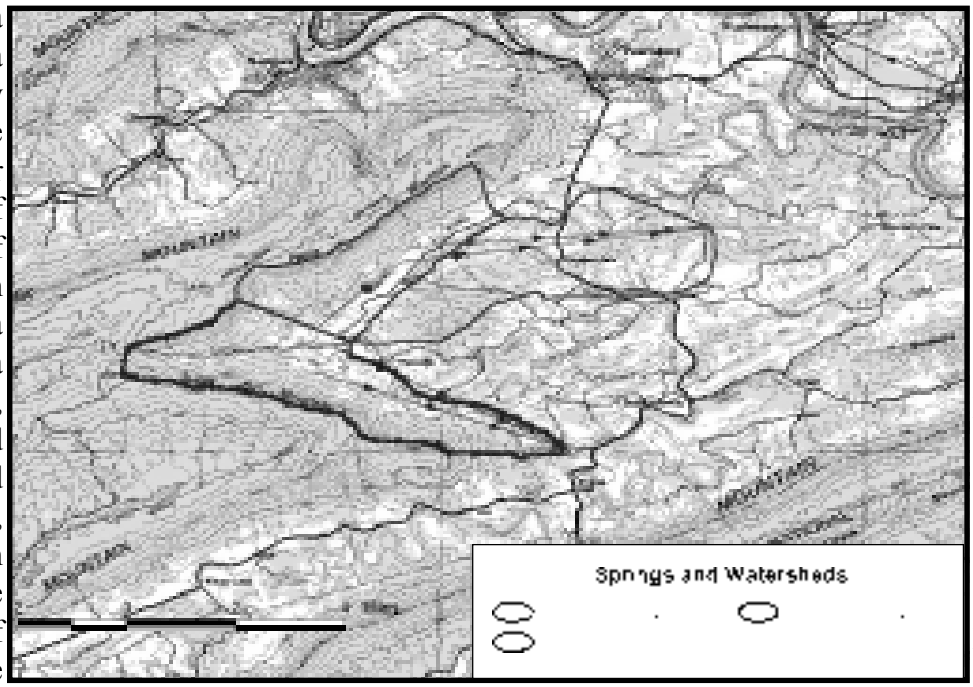
A Water Policy Technical Advisory Committee was constituted in April of 2003. This committee will meet through the early fall of 2003 to provide guidance to the Department in drafting regulatory criteria for local and regional water supply plans. The membership of this committee and documentation of their activities can be found at http://www.deq.state.va.us/info/waterpolicy.html. Concurrently the Department has issued a notice of intended regulatory action publicizing the beginning of the regulatory development process for water supply planning regulations and requesting public input.

Additional information regarding water supply planning issues can be obtained by contacting Terry Wagner with the Department of Environmental Quality, at 804-698-4043 or *tdwagner@deq.state.va.us*.

The Virginia Karst Program

The Virginia Karst Program is part of the Department of Conservation and Recreation's (DCR) Division of Natural Heritage, and is funded by EPA Section 319 Grant funds. The mission of the karst program is to protect the biological and hydrological resources of Virginia's karst lands, where, over geologic time, dissolution of soluble bedrock has produced a landscape riddled with disappearing streams, sinkholes, caves, and large springs. Protection of these resources improves water quality for human consumption and habitat for a myriad of rare fauna and flora. A variety of human land-use practices endanger the viability of habitats and quality of ground water in karst. Through a combination of data development, education and outreach, and technical assistance, the karst program works to minimize adverse impacts of human activity on the karst landscape.

During fiscal year 2003, data development efforts were concentrated on the determination of boundaries of conservation sites for Virginia's significant caves, as designated by the Virginia Cave Board of DCR. This work involved extensive tracer dye studies to determine the watersheds, or source water areas, for streams and lakes in these caves and recharge areas of associated springs. In 2003, efforts concentrated on sites in Lee, Bland, and Giles counties. Additional tracer dye studies were performed in support of the Mossy Creek/Long Glade Total Maximum Daily Load (TMDL) development study in Augusta County, and in the Warren County Enterprise Zone. To date, only a tiny fraction of Virginia's surface area that lies on or upslope of karst has been assigned to specific karst basins. Complete delineation of these watersheds is an essential step to long-term protection of karst resources. A sample of such a map from Giles County is shown below. The arrows indicate tracer dye flow paths.



Karst program staff also perform limited biological inventories of caves in conservation sites and proximal to development threats. During 2003, a new locality for the federally endangered Lee County Cave Isopod was discovered, resulting in modifications of the Fish and Wildlife Service's strategy for implementation of the recovery plan. This site has recently been incorporated into the State Natural Area Preserve System.

Equally important to resource documentation is the education and outreach necessary to convince stakeholders of the importance of these resources and the knowledge to protect them. The karst program's educational mission is achieved largely through the delivery of the Project Underground curriculum, developed and based in Virginia. During fiscal year 2003, there were at least 12 workshops, reaching over two hundred science teachers.

The Project Underground curriculum is closely matched to the Virginia Department of Education Standards of Learning, which means the material from the workshop is delivered to the classroom and, ultimately, reaches the students' homes. In addition to teachers, students, and parents, karst education workshops are conducted for personnel at numerous agencies, including soil and water conservation districts and state parks. Karst education is provided to the public, at large, through venues such as the Virginia Tech Farm and Family Showcase, and to targeted audiences through theme-based workshops such as two karst stormwater workshops that were held in Radford in fiscal year 2003. Demand for both the stormwater workshops was so high that individuals had to be turned away!

The karst program serves as a free, "on-call" consultant to agencies, local governments, and individual citizens. During the last year, comment was

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Virginia Ground Water Festivals

Two Ground Water Festivals were held in 2002. Financial support was provided through DEQ's Ground Water Protection Grant from the Environmental Protection Agency and National Project WET in cooperation with Nestle Waters North America. Mary Ann Massie coordinated the festival held at Breaks Interstate Park in Dickenson County. There was support at the festival from the following organizations: Lonesome Pine Soil and Water Conservation District, USDA Natural Resources Conservation Service, Dickenson County Health Department, VA Dept Conservation and Recreation, VA Dept of Mines, Minerals, & Energy, Dickenson County Litter Control, McClure River Kiwanis Club, Guest River Restoration Project, VA Dept of Environmental Quality-Southwest Regional Office, VA Rural Water Association, and the VA Ground Water Protection Steering Committee.

220 sixth graders attended the festival with sessions on septic drainfields, land use impacts to ground water and other natural resources, litter impacts to natural resources, mining and ground water, the water cycle, and soils in the Cumberland Plateau.

Students gather around a table top model of an onsite sewage disposal system, or septic drainfield.

Testing the Water -- Northumberland students tested the water of the Great Wicomico River for pH, dissolved oxygen, and for salinity using a hydrometer. Land use management and water quality were discussed.

A second festival was held in Northumberland County at Camp Kittamaqund, site of the 2001 festival. This festival was organized by Mrs. Audrey Brainard, a 2001 volunteer. Mrs. Brainard did an exceptional job recruiting session leaders and volunteers. The supporting organizations for the Northumberland festival were: Chesapeake Bay Garden Club, Virginia Cooperative Extension 4-H, Master Gardeners, Northumberland Association for Progressive Stewardship, Northern Neck Audubon, Northern Neck Soil and Water Conservation District, Northumberland County Health Department, Three Rivers Health District, SAIF Water Committee/ Interfaith Service Council and the Unitarian Universalist Fellowship. Their sessions covered septic drainfields, wells, formation of springs, land use impacts, wetlands issues, soil properties, and water testing. 120 sixth graders attended this festival.

A festival for 2003 is being planned for sixth grade students from Powhatan County. The festival will be held at the Cub Scout and Webelos Adventure Camp in Goochland County.

For more information contact Mary Ann Massie at 804-698-4042.

The Ground Water Protection Steering Committee

meeting is held the third Tuesday of every other month

(January -- March -- May -- July -- September -- November)

All are Welcome to Attend

Meetings are normally held at the Department of Environmental Quality, 629 East Main Street, Richmond, from 9:00 to 11:00 a.m.

For more information, contact Mary Ann Massie, Department of Environmental Quality, at (804) 698-4042

Meeting summaries and announcements are posted on the Regulatory Townhall at **www.townhall.state.va.us**

Hands-on Learning -- a student uses a soil auger in this lesson on soil properties.

Ground Water Studies in Virginia by the USGS in 2003

The U.S. Geological Survey (USGS) continues to carry out several cooperatively funded hydrologic investigations of Virginia's ground water resources. These investigations are providing relevant and reliable hydrogeologic information that will contribute toward assessing, managing, and protecting the Commonwealth's ground water resources. Among the current efforts, an assessment of the availability of ground water in the northern Shenandoah Valley carbonate and siliciclastic aquifer systems continues this year in cooperation with the counties of Frederick, Warren, and Clarke. This work focuses on an evaluation of existing information, an inventory of wells, and development of a ground water data collection network. Along with discharge data from selected streams, this information is being used to calculate water balances for the aquifer systems. During the past year, this work has been broadened in scope to encompass new hydrologic investigations in the northernmost Shenandoah Valley counties of West Virginia, and in the future we anticipate that a multi-scale ground water flow model will be developed in association with the U.S. Geological Survey's National Research Program.

Data collection also continues in the Polecat Creek watershed where, in cooperation with the Chesapeake Bay Local Assistance Department, the USGS is assessing ground water as a nutrient transport pathway to streams draining to the Chesapeake Bay. This study, which included age-dating of ground water, has provided new information on nutrient transport times in ground water in shallow Piedmont and Coastal Plain aquifers. It is anticipated that 2003 will mark the end of the current ground water component of the Polecat Creek study. This work will likely be evaluated and revisited in future years.

The USGS also is completing an assessment of the Virginia Beach shallow aquifer system. New data on the hydrogeologic framework of this complex aquifer system have been incorporated into a ground water model, and the potential for saltwater intrusion is being evaluated using particle-tracking techniques. The final technical report and a lay reader report on the work will be completed in 2003.

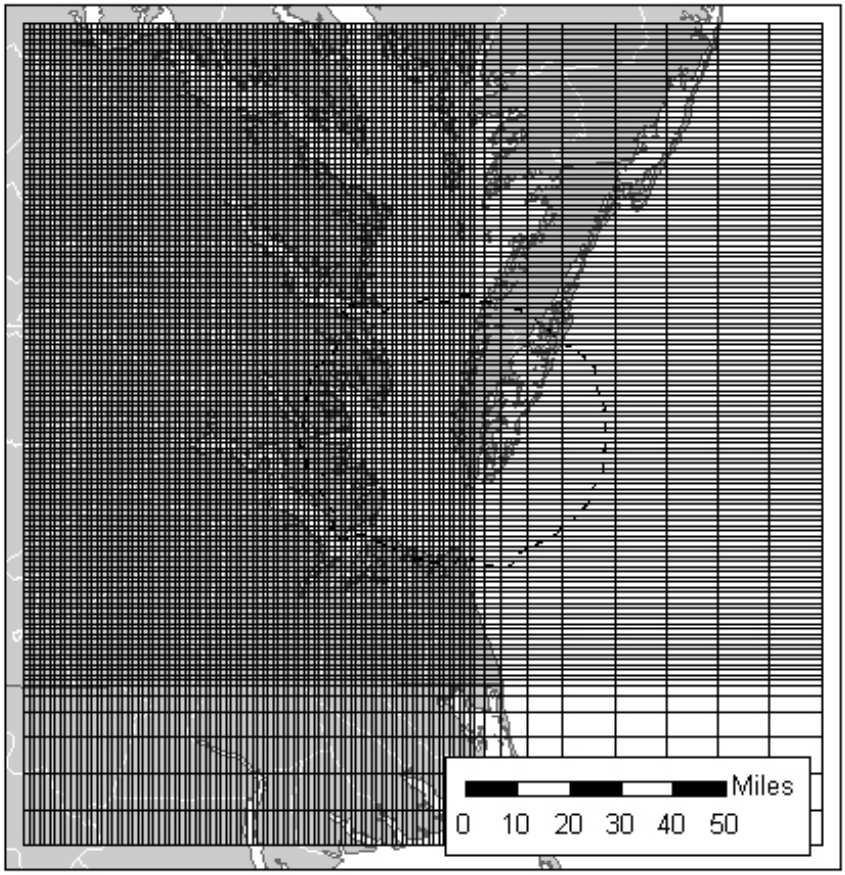

Figure 1: Finite-difference grid for the revised ground water model of the Virginia Coastal Plain

In the summer of 2003, the USGS will begin a three-year project to update and revise the Eastern Shore ground water flow model. This project is being conducted in cooperation with the Accomack-Northampton Planning District Commission (PDC), and the Virginia Department of Environmental Quality . The project will entail collection of ground water quality samples from representative wells to define the chloride distribution in the aquifer system. A sub-sample of these wells will be analyzed for ground water age dates to estimate ground water recharge rates. These data will be used to establish a ground water flow model using the new SEAWAT code. The Eastern Shore of Virginia received sole-source aquifer designation from the USEPA. The Eastern Shore is designated by the Commonwealth of Virginia as a ground water management area as well. The updated model will be used by local communities for long-term water supply planning and by the Virginia DEQ to support ground water permitting decisions.

Lastly, characterization of ground

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Source Water Assessment Program

The Virginia Department of Health (VDH), the state's Primacy Agency for Drinking Water, was required by the 1996 Amendments to the Safe Drinking Water Act (SDWA) to develop a Swap Water Assessment Program (SWAP). The SWAP includes delineating the boundaries of a source's assessment area, performing an inventory of land use activities of concern, and determining a relative susceptibility of the source to the activities. The availability of the assessment to the waterworks owner and the public completes the first three steps in a Source Water Protection effort.

Source Water Assessment Results

Virginia gathered data from many different federal, state, local agencies and governments, as well as private companies. In total, our Geographic Information System (GIS) processed data from more than 12,000 Potential Sources of Contamination (PSCs) and found 2,902 PSCs to be present in Zone 1 and 2 of groundwater source delineation areas. In addition, our GIS found 861 PSCs to be present in Zone 1 of surface water source delineation areas.

SWAP Update

Overall, there are more than 3,000 public water systems in Virginia, serving safe drinking water to more than 80% of Virginia's population. The assessments indicated that very few sources have high levels of protection in place. Many public water systems are not in control of land use activities in a community. The Office of Drinking Water (ODW) encourages public waterworks to purchase land or conservation easements to reduce development risks.

For more information, contact the Virginia Department of Health's Office of Drinking Water at http://www.vdh.state.va.us/dw/financial.asp or the Virginia Outdoors Foundation at http://virginiaoutdoorsfoundation.org/. Where land acquisition is not financially or logistically possible, VDH encourages waterworks and municipalities to work together to adopt reasonable controls on development that protect water quality. Most do not own the entire contributing area for their source, and many local governments have been reluctant to adopt protective zoning or other ordinances to reduce the risks of development in these areas.

The assessments have identified future growth in source protection areas as the dominant risk factor threatening waterworks. The Office of Drinking Water has been working with a number of other state agencies to distribute and share SWAP data in an effort to bring more awareness to source protection areas. The Office of Drinking Water also has the ability to provide maps to municipalities showing their source protection areas and maintains a Geographic Information System that can be used to assist in planning future developments to avoid impact on source protection areas.

Source Water Protection Awards

The purpose of the Source Water Protection Award is to recognize and encourage leadership, innovation, and dedication to source water protection. Awards will be given annually. The 2001 award was presented to the Town of Stanley in Page County. The 2002 award was presented to James City Service Authority for their innovative well abandonment program called "Cap It". 2003 nominations have been forwarded to Environmental Protection Agency and will be awarded during the summer of 2003.

Now that the April 30, 2003 deadline has passed and Virginia's comprehensive assessments of Public Water Supplies are complete, the Office of Drinking Water plans to begin implementing a new phase of source protection activities. ODW has recently awarded a contract to assist small community waterworks serving populations less than 3,300 to develop and implement Wellhead Protection Programs (WHP). Approximately 600 waterworks fall into this category.

For more information, contact Chris Adkins at 804-786-5568 or *cadkins@vdh.state.va.us*

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The ten most commonly found Land Use Activities are shown below in the order of occurrence.

Classification
1. On-site sewage system
2. Fuel Storage Systems
3. Pasture (grazing)
4. Crop and fodder production
5. Primary Roadways
6. Parking Lots
7. Gasoline Station/Service Center
8. Solid Waste Collection/Transfer Site
9. Wastewater Pump Station
10. Underground Storage Tanks

2002 Pesticide Disposal Program

The Virginia Department of Agriculture and Consumer Services (VDACS), in cooperation with the Virginia Pesticide Control Board (PCB) and Virginia Cooperative Extension (VCE), implemented its 12th Pesticide Disposal Program in September 2002. The program was conducted in 35 Southwest Virginia localities. The 2002 program completed the second round of pesticide disposal programs in all Virginia localities.

A total of 31,998 pounds of pesticide waste was collected from 81 agricultural producers, pesticide dealers, and pest control firms. Seven independent cities and three counties did not have any pesticides requiring disposal. The disposal contractor was Care Environmental with a disposal cost of $1.18 per pound.

Since the program's inception in 1990, more than 474 tons of unwanted, outdated and banned pesticides have been collected from more than 2,100 participants. The total direct cost for the programs exceeds two million dollars, with approximately half coming from federal grants and the remainder from pesticide fees collected by VDACS. No general fund tax dollars have been used to implement the program.

Unwanted pesticides for disposal

2002 PLASTIC PESTICIDE CONTAINER RECYCLING PROGRAM

The Virginia Department of Agriculture and Consumer Services, in cooperation with the Virginia Pesticide Control Board and local governments, continued the Plastic Pesticide Container Recycling Program (PPCRP) in 2002. The program offers the agricultural community, as well as pest control firms, an environmentally responsible alternative for the disposal of properly rinsed plastic pesticide containers. In its tenth year of operation, the PPCRP recycled approximately 56,000 plastic pesticide containers in twenty localities and fourteen pesticide dealer locations around Virginia.

The PPCRP is a local program available to all Virginia localities. To participate, the locality must apply to VDACS and agree to collect, inspect and store the properly rinsed pesticide containers until granulation (or "chipping" of the plastic containers into small chips or flakes). VDACS provides $1,875 in cost-reimbursement grants to participating localities to help offset the localities' costs for conducting the program.

Since the program's inception in 1993, over 558,000 plastic pesticide containers have been recycled rather than being burned or placed in landfills. This equates to over 419,000 pounds, or 209 tons, of plastic.

For more information contact Dan Schweitzer at 804-786-4845 or *dschweitzer@vdacs.state.va.us*

Pesticide containers awaiting recycling

*(Continued from **SWAP** on page 6)*

A summary of Potential Conduits discovered in Zone 1 of the Assessments is shown below.

Type	Totals
Abandoned Wells (which have not been permanently abandoned according to the VDH Regulations)	38
Caves / Sinkholes	279
Elevator Shafts	0
Other Wells in Use (other than wells constructed in accordance with the VDH Regulations)	5,655
Ponds, streams	2,269
Vertical Ground Source Heat Pump Systems	2
	8,243

Agricultural Stewardship Act Program (continued)

*Continued from **ASA** on page 2*

The ASA addresses water pollution problems caused by nutrients, sediments and toxins entering state waters from agricultural activities. Twenty-four of the complaints received in the reporting period indicated that both sediments and nutrients were involved. Twelve complaints were attributed to pollution problems involving nutrients only, while five faulted only sediments as contributing to pollution problems.

Percentage of Complaints
April 1, 2002 – March 31, 2003
Beef – 37%
Cropland – 17%
Dairy – 17%
Horse – 10%
Poultry – 8%
Beef/Horse – 5%
Beef/Hog – 2%
Hog – 2%
Other – 1%

The Commissioner's Office, together with local SWCDs in many cases, completed investigations for 29 of the official complaints received. As of March 31, 2003, 12 complaints were awaiting investigation and/or a decision by the Commissioner.

Type of Complaints By %
April 1, 2002 – March 31, 2003
Sediment and Nutrients – 59%
Nutrients only – 29%
Sediment only – 12%

Of the 29 complaints on which the Commissioner acted before the end of the twelve-month period, Department investigations determined that 14 of the complaints revealed insufficient or no evidence of water pollution; therefore-these complaints were unfounded. In four cases, the complaints were dismissed because the complaints related to matters outside of the purview of the ASA. In 11 of the investigations, there was sufficient evidence to support the allegations that the agricultural activities were causing or would cause water pollution. These cases were determined to be founded.

Results of Complaints
April 1, 2002 – March 31, 2003
Unfounded – 34%
Founded – 27%
Dismissed – 10%
Awaiting Decision by
Commissioner – 29%

Plan Development, Review and Maintenance

VDACS' efforts to investigate complaints are just the beginning when a complaint is determined to be founded. The agency is also charged with working with farmers and local soil and water conservation districts on the development of plans to address identified pollution problems. VDACS is responsible for conducting six-month and 18-month field reviews to make sure that plans are on schedule (as far as implementation), and that implemented plans are maintained to prevent the re-occurrence of pollution problems identified by the Department in its response to complaints received under the ASA.

Educational Activities

In addition to participating in meetings held by state SWCDs at the regional and state levels and participating in meetings held by various commodity and agricultural groups, the ASA staff manned an exhibit on the ASA program in September 2002 at the Farm and Family Showcase conducted by Virginia Tech. VDACS also conducted an ASA training workshop during August 2002 for SWCD staff and others who assist the Department with the ASA program.

Closing Notes

The ASA program continues to be successful in providing a positive approach to concerns about farm operations. As noted earlier, cooperation from SWCDs and the agricultural community has been key to this overall success.

The number of official complaints the Department received during the twelve-month reporting period varied from month to month. Ten were received during the first two months, ten received during the next eight months, and 21 (51%) received in the last two months. Dry weather through the fall of 2002 reduced the conditions that might prompt complaints. In turn, a significant increase in rainfall toward the end of the reporting period appears to have produced a dramatic increase in complaints.

For more information, contact Glenn Martin at 804-786-2658 or *gmartin@vdacs.state.va.us*

Spread the Word!!!

Do you know of an individual or organization who would benefit from receiving a copy of this and future Annual Ground Water Reports?

Call Mary Ann Massie
(804) 698-4042

Water Infrastructure Security

Presidential Decision Directive 63 (PDD 63), issued on May 22, 1998, identified eight critical infrastructures to the United States. The water infrastructure was one of the original eight. Water infrastructure includes both the drinking water and wastewater industries. It called for "...vulnerability assessments...for each sector of the economy and each sector of the government that might be a target of infrastructure attack intended to significantly damage the United States...", and "...within both the government and the private sector to sensitize people to the importance of security and to train them in security standards..."

The US Congress reinforced the concern for the water infrastructure when it passed Title IV, PL 107-188, *The Public Health, Security, and Bioterrorism Preparedness and Response Act (Bioterrorism Act)* amending the Safe Drinking Water Act (SDWA). The SDWA now requires community waterworks serving populations over 3,300 to conduct vulnerability assessments. Small systems (serving populations between 3,300 and 49,999) have until June 30, 2004, and medium systems (populations between 50,000 and 99,999) have until December 31, 2003, to complete vulnerability assessments. Large drinking water systems serving populations over 100,000 had until March 31, 2003, to submit their vulnerability assessments to the United States Environmental Protection Agency (USEPA). Within six months of submitting the vulnerability assessment, waterworks have six months to revise or complete an emergency response plan.

The chart below summarizes the number of public water systems, and their source, required to develop a vulnerability assessement under the Bioterrorism Act.

Virginia Waterworks	Number in Category	Source Type
Large	15	Surface Water; Ground Water
Medium	4	All Surface Water
Small	135	Surface Water; Ground Water

Security Workshops

The Virginia Department of Health's Office of Drinking Water (ODW) conducted several security workshops during the months of March, April and May for the small and medium waterworks. Since the large waterworks were able to apply for grant money directly from the US EPA, ODW developed its own training workshop on security featuring Vulnerability Self Assessment Tools *(VSAT™) water*. Two-day workshops were offered for free to waterworks at locations throughout the Commonwealth. It is estimated that more than half of the small and medium size waterworks attended one of the workshops. Many of the waterworks that did not attend have expressed interest in using either *VSAT™ water* or the *Security Vulnerability Self-Assessment Guide for Small Drinking Water Systems Serving Populations of 3,300 and 10,000.*

Vulnerability Tools and Guides

In January 2003, the Association of Metropolitan Sewerage Agencies (AMSA) released two new VSAT™, one for joint water/wastewater utilities and another for small-medium sized water utilities. *VSAT™ water/ wastewater* provides the valuable online vulnerability assessment capabilities to utilities providing both wastewater treatment and water supply services. Its new counterpart, *VSAT™ water*, will do the same for both publicly and privately owned water utilities. These new software tools, developed by AMSA via a cooperative agreement with the USEPA, provide a user-friendly approach to evaluate, prioritize and reduce vulnerabilities based upon five critical utility asset categories.

Security Vulnerability Self-Assessment Guide for Small Drinking Water Systems Serving Populations of 3,300 and 10,000 is a vulnerability assessment guide targeted at community drinking water systems

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provided on numerous projects through the state environmental review program, including the screening of hundreds of VDOT projects for potential impacts to karst. Several utility projects crossing karst lands were reviewed, and comments and field assessments were provided to localities where rural residential developments were planned for sensitive karst areas. Technical assistance was also provided for industrial sites in Warren and Pulaski Counties.

A long-term project of the karst program is the Batie Creek TMDL in Lee County, where leachate from vast sawdust accumulations has fouled a cave stream and spring, which led to the listing of the Lee County Cave Isopod under the Endangered Species Act. Initially brought to attention by the Virginia Cave Board of DCR, Batie Creek has been a focus for 15 years. During 2003, an interagency effort, spearheaded by karst program staff, led to the first removal of sawdust and its subsequent use as a beneficial soil amendment for mined land reclamation.

For more information, contact Wil Orndorff at 540-831-4056 or *worndorff@dcr.state.va.us*

Dry Well Replacement Program

In November 2002, Governor Mark Warner announced the creation of the Virginia Dry Well Replacement Program (DWRP) to provide funds to drill new wells for low-income citizens whose wells have failed due to the drought.

Between July 1, 2002 and October 15, 2002, more than 6,200 homes applied for well replacement permits. Many of the wells were shallow wells directly affected by drought conditions.

The aim of the DWRP is to provide a reliable (deep well) source of water that is drought resistant. The DWRP is a temporary set-aside program in which $2.5 million has been reserved to provide financial assistance to qualifying low-income households. Two million dollars in funding originates from the Community Development Block Grant Program (CDBG) and the remaining $500,000 is provided by the Indoor Plumbing Rehabilitation (IPR) Program. Funding is provided on a first-come, first-served basis.

The DWRP is administered through local governments and nonprofits in CDBG non-entitlement localities, which are localities that do not receive CDBG funding directly from the U.S. Department of Housing and Urban Development (HUD). Only those localities eligible for Virginia non-entitlement CDBG and IPR funds are eligible to access the DWRP.

A locality that is interested in making use of the DWRP fund must submit a letter of request to the Virginia Department of Housing and Community Development (DHCD). The submittal letter must outline the general need for replacement wells and a list of specific households needing new wells, designate a subrecipient to carry out the program or indicate how the county will implement it with existing staff, and state that the local government will assume responsibility for the administrative requirements including drawdown and oversight of funds related to the CDBG program. There may be a requirement for an advertised public hearing and the adoption of certain resolutions by the local governing body, unless HUD provides a waiver. Otherwise, the letter of request will constitute the county's application and trigger issuance of a contract by DHCD that will authorize the obligation of funds for up to five replacement wells at a time. The locality must have applied to the DWRP and received a contract for a household to be eligible for the program.

The entities (local government, non-profit organization, etc.) that administer the DWRP also administer the CDBG program for non-entitlement localities. Typically, the grantees are working in communities and have better knowledge of households in need as well as a familiarity with local contractors.

Local government DWRP duties also include soliciting eligible households for a waiting list, obtaining bids or standard unit prices from well drillers, executing the loan agreement with the homeowner and recording the lien, obligating funds from DHCD, authorizing well installation and paying contractors.

Localities may only use the DWRP to provide financial assistance to owner-occupied households whose source of water must have failed or have been unusable for a sustained period, and which have a gross income below 80 percent of an area's median family income.

Permitting, drilling, and well installation are eligible DWRP expenses, as are associated costs of installing the well including grouting, housing, liner, pumps, and service lines. The program requires connections to public water systems if it can be done within the maximum amount of funding per well ($5,000). In such cases, the locality may not charge a "tap" or "connection" fee. Administrative, legal and other related non-construction costs eligible up to a maximum of $750. (Maximum total cost per well is $5,750). DHCD will not pay for drilled holes that do not result in finding water.

Funds are made available to individuals as a zero percent interest loan, amortized over ten years. Payback of the loan is predicated on the client's ability-to-pay. Loans must be secured with a lien held by the locality or subrecipient. The difference between the client's ability-to-pay and the actual cost of the loan per month at 0% interest is forgiven on a monthly basis.

As of June 2003, at least 41 counties had applied to the DWRP and 144 projects had been set up under the DWRP. Approximately $747,444 in funding has been obligated and $424,172.82 has been spent.

For more information, contact Todd Christensen at 804-371-7186 or *tchristensen@dhcd.state.va.us*

http://www.deq.state.va.us/gwpsc

Ground Water Protection Steering Committee Website

Do you want to learn more about the Steering Committee's work? Or find web sites with ground water information? Let us know what you think of the site while you're there!

http://www.deq.state.va.us/gwpsc

Year in Review (continued)

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primary disaster designation for dozens of Virginia localities. Loss for Virginia agriculture from damages to summer and late spring crops in 2002 is estimated at more than $252 million. Thousands of homeowners were forced to seek new sources of water supply as their wells failed.

Although the state-imposed restrictions on water use were lifted in mid-November 2002, it was not until record rainfalls last spring that analysts felt comfortable declaring an end to the drought.

Responses to the drought included:

• The **Drought Monitoring Taskforce**, led by DEQ's Terry Wagner, met periodically to collect accurate information about the impact of the drought.

• A **Drought Response Technical Advisory Committee** was formed to develop a state drought monitoring and response plan.

• SB1221 (**Water Supply Planning**) required the State Water Control Board, in consultation with the State Health Commissioner, local governments, public service authorities, and other interested parties to establish a comprehensive water supply planning process for the development of local, regional, and state water supply plans. Consistent with this requirement, the **Water Policy Technical Advisory Group** was established to provide recommendations to: 1) improve state and local water supply planning, and 2) improve the Commonwealth's water resources management programs.

• HB1505 (**Emergency Water Supply Protection Permits**) authorizes the State Water Control Board to issue an emergency Virginia Water Protection Permit to meet public drinking water supply needs during drought or low flow conditions.

• HB2156 **(VDH/DEQ SRF Cooperation)** ensures that VDH and DEQ will work even closer in areas of mutual interest.

With all the attention paid to drought and budget cuts, it was easy to forget the significance of post-9/11 Water Security. The Safe Drinking Water Act was amended after September 11, 2001 to include a vulnerability assessment requirement to secure public drinking water supplies. New software, the Vulnerability Self-Assessment Tool (VSAT), was developed to conduct assessments. These vulnerability assessments must be completed by late 2003 or early 2004.

The DEQ also concluded the Water Resources Impact Work Group in November 2002. The Work Group's Report identifies tools and options to improve the Commonwealth's understanding and management of the combined impacts of new facilities on water supply and in-stream uses.

All of this activity occurred despite substantial budget cuts facing state agencies and local governments.

*Continued from **USGS** on page 5*

water in the Virginia Coastal Plain continues this year. This large scale effort is being carried out in cooperation with the Virginia Department of Environmental Quality and the Hampton Roads Planning District Commission. Collaborative research by USGS and DEQ led to the discovery of the Chesapeake Bay impact crater and, with recognition of its implications for the ground water resource, a revision of the Coastal Plain aquifer framework and ground water flow model (see 2000, 2001, and 2002 *Annual Reports*). Previous efforts have entailed drilling sediment cores and analyzing geophysical logs to delineate the configuration of aquifers and confining units, and performing hydro-chemical analyses to understand the origin of salty ground water associated with the crater. This year, the revised aquifer framework has been expanded to encompass the entire Coastal Plain in Virginia and adjacent parts of Maryland and North Carolina, and is being refined using a geographic information system. A new regional ground water flow model encompassing these and adjacent offshore areas is being designed utilizing the MODFLOW-2000 code. This code has the ability to simulate variable-density flow effects near fresh-saltwater transition zones in the coastal and crater areas, a significant improvement over previous models. One-mile horizontal finite-difference-cell spacing in Virginia (Figure 1) will enable accurate ground water level computation with acceptable computer run times. Fine vertical resolution (35 feet) enables aquifer-framework data to be faithfully translated to the simulated hydraulic-conductivity distribution, and accurate simulation of fresh-saltwater transition zones in coastal aquifers. Head-dependent flux boundary conditions simulate recharge, evapotranspiration, and interaction with surface-water features, such as major rivers, lakes, the Chesapeake Bay, and the Atlantic Ocean. Transient saltwater-transport simulations of Pleistocene glacial periods have improved understanding of the persistence and distribution of saltwater in the impact crater. On-going efforts include incorporation of historic ground water withdrawal data for transient simulations and calibration to observed ground water levels, ages, and salinities.

For more information, contact Randy McFarland at 804-261-2600.

Summary of the Virginia Water Resources Research Center's Activities

In an effort to assist the Commonwealth in its development of a water resources management plan, the Virginia Water Resources Research Center (Water Center) and the Virginia Military Institute (VMI), in collaboration with the Virginia Department of Environmental Quality, planned a stakeholders' forum in conjunction with the 2003 Environment Virginia conference held in Lexington, Virginia. The forum was titled Virginia Water Policy e-Dialogue: Prioritizing the Management of Virginia's Water Resources, and approximately 100 stakeholders participated in this innovative process. The objective of this forum was to receive input from stakeholders and give the results to the state's planning organizations developing the water resources management plan for Virginia.

A team of experts from state agencies, academia, and consulting firms comprised the working committee for this collaborative effort. Based on guidance from the Virginia Department of Environment Quality, the dialogue contents and term definitions were organized around five major categories: water supply management, source water protection, beneficial uses of water, governmental collaboration, and governing authority. Each of these topics was broken down into sub-categories. The "ExpertChoice" decision software was the method used to receive stakeholder input. Stakeholders used a hand-held radio frequency keypad to register their water management objectives and preferences. Then the "ExpertChoice" software summarized and displayed the stakeholders preferences as bar graphs so everyone could see the overall proposed water management priorities. This information is expected to be used by the state planning agencies to develop Virginia's comprehensive water management plan. For a complete summary of the Water Policy Dialogue and a list of the team of experts, log onto the VMI Environment Virginia website: http://environmentva.org/Agenda/Dialogue/DialogueDefinitions.pdf

Grant Awards

Each year the Water Center sends out requests for research proposals (RFPs) and this year four competitive grants were awarded for the following research projects:

- Gregory S. Hancock, the College of William and Mary, "Hydrologic Impacts of Urbanization on Small Watersheds and the Effectiveness of BMPs."
- Kurt Stevenson, Virginia Tech, "Water Demand Reduction Effectiveness of Drought Curtailment Policies in Virginia."
- Peter Vikesland, Virginia Tech, "Effects of Dissimilatory Iron Reducing Bacteria on the Longevity of Iron Permeable Reactive Barriers."
- James N. Galloway, University of Virginia, "Identification of Native Brook Trout Streams that are Impaired by Acidification."

Seed Grants

In addition, the Water Center awarded two seed grants. These seed grants are given to researchers in the anticipation that they will be able to develop larger proposals for submission to other funding agencies. The seed grants were given to:

- James A. Smith, University of Virginia, "Monitored Natural Remediation of Contaminated Ground Water by Diffusion and Barometric Pumping."
- Vinod Lohani, Virginia Tech, "Initiation of Activities to Establish an Institute for Drought Management Studies."

The Virginia Service Training for Environmental Progress (STEP) program is directed by the Water Center. This year four students were selected to go out into Virginia communities and help study, understand, and work toward resolving water resources issues. Nathan Mitchell, environmental policy and planning, will be helping the Agriculture and Nature Center in Rockingham County identify potential conservation practices for its stream, pond, and landscape that can be implemented and used for environmental education. Chris Perez, environmental policy and planning, will help the Lonesome Pine Soil and Water Conservation District in Wise County coordinate the implementation of a wetlands complex being constructed to improve water quality in an acid-mine-drainage impacted stream on the campus of the University of Virginia's College at Wise. Zhou Daquan and Toby Ieuter, urban and regional planning, will be helping the New River Valley Planning District Commission with two projects: research for the risk – assessment section of a regional natural-hazards mitigation plan and research into the potential for a regional water-supply plan.

In response to Senate joint resolution No. 381, the Water Center is in the process of putting together a report for presentation to the Governor and General Assembly on the use of desalination technologies as part of the strategy to meet the Commonwealth's drinking water needs. This report will be posted on the General Assembly's website.

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DEQ Forms Water Resources Impact Work Group

In June of 2002, DEQ Director Bob Burnley formed two work groups to study the combined impacts that large facilities potentially have on air quality and water quality and quantity in Virginia. The air and water work groups were established due to concerns with impacts of numerous power plants proposed for construction in Virginia and the level to which those impacts were evaluated in DEQ's permitting and environmental review programs. The groups were given a tight five month window to produce a report which could be provided to state legislators prior to opening of the 2003 General Assembly session. The Water Resources Impact Work Group consisted of representatives from various environmental interest groups, industries, municipalities, water resource trade organizations as well as state and federal agencies. Director Burnley offered four objectives for the Water Resources Impact Work Group:

- *Develop an approach to ensure that the full impacts on water resources and supplies are considered during the environmental impact review process.*
- *Identify the appropriate tools that are available to assess these impacts, including development or refinement of models.*
- *Identify the appropriate tools that could be used to address these impacts once identified.*
- *Develop cost estimates for implementation of each of these and identify any non-state funds that may be available for these purposes, including federal funds and private funds.*

The group met five times and developed a list of 27 options to address the four objectives listed above. The options emphasized the need for additional water resources informational, planning and permitting tools, including:

- Improvements to DEQ's environmental impact review process
- Improvements to DEQ's Water Withdrawal Reporting Program
- Establishing/re-establishing stream and ground water monitoring stations
- A long term plan to evaluate ground water flow systems in fractured-rock and karst terrains
- Initiation of a new statewide water supply resource planning and management effort
- Instream flow analyses for each major river basin
- Expanding the use of Ground Water Management Area and Surface Water Management Area programs
- Permitting or registration of all major ground water withdrawals
- Changes to the Virginia Water Protection Permit program to address "grandfathered" and "temporary" intakes, inadequate water storage capacity, etc.

The Water Resources Impact Work Group completed their evaluation in November 2002 and the results were made available to members of the legislature. A discussion of all 27 options is included in the Water Resources Impact Work Group's Final Report available at http://www.deq.state.va.us/info/imapctstudy.html or by contacting Allan Brockenbrough of DEQ at 804-698-4147.

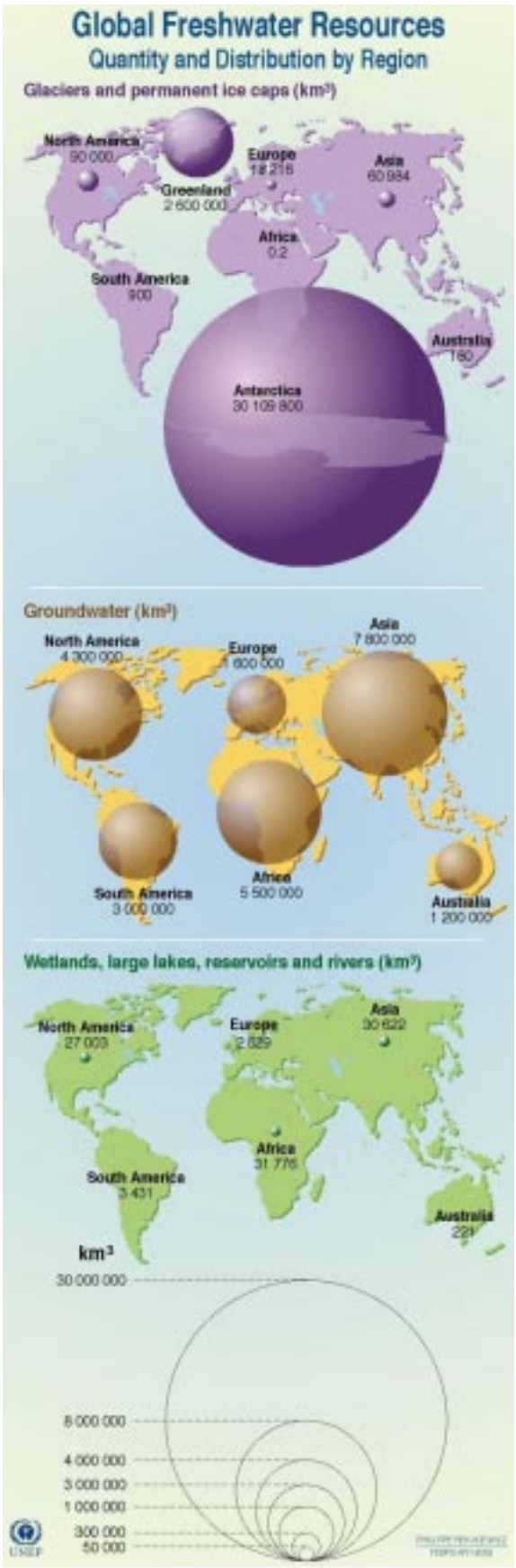
2002 Ground Water Festival participants

Continued from ***Security*** *on page 9*

serving between 3,300 and 10,000 people. The guide is now available and is designed to help these systems complete vulnerability assessments required by the *Bioterrorism Act*. The updated guide was developed by Association of State Drinking Water Administrators (ASDWA) and National Rural Water Association (NRWA) to meet the basic requirements of a vulnerability assessment, and will help small drinking water systems assess their critical components and identify security measures that should be implemented.

Another guide that is available is the *Small Systems Vulnerability Self Assessment Guide*, which is recommended for community systems serving populations under 3,300. This is a checklist jointly developed by ASDWA and NRWA.

For more information, contact Chris Adkins at 804-786-5568.



Note: Estimates refer to standing volumes of freshwater.

Source: Igor A. Shiklomanov, State Hydrological Institute (SHI, St. Petersburg) and United Nations Educational, Scientific and Cultural Organisation (UNESCO, Paris), 1999; World Meteorological Organisation (WMO), International Council of Scientific Unions (ICSU); World Glacier Monitoring Service (WGMS); United States Geological Survey (USGS).

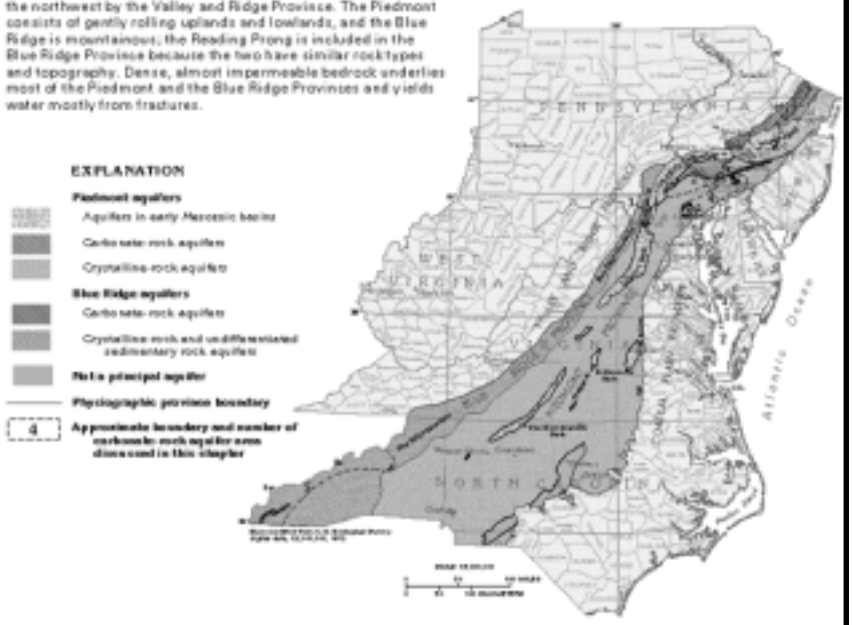
United Nations Environment Programme
Vital Ground Water Statistics

Highlights from assessment activities over the past two decades, which are used to establish present and future water trends, reveal that:

Ground water is by far the most abundant and readily available source of freshwater, followed by lakes, reservoirs, rivers and wetlands:

- Ground water represents over 90% of the world's readily available freshwater resource (Boswinkel, 2000). About 1.5 billion people depend upon ground water for their drinking water supply (WRI, UNEP, UNDP, World Bank, 1998).
- The amount of ground water withdrawn annually is roughly estimated at ~600-700 km^3, representing about 20% of global water withdrawals (WMO, 1997).
- A comprehensive picture of the quantity of ground water withdrawn and consumed annually around the world does not exist.
- Agricultural water use accounts for about 75% of total global consumption, mainly through crop irrigation, while industrial use accounts for about 20%, and the remaining 5% is used for domestic purposes.

~ from **Vital Water Graphics: An Overview of the World's Fresh and Marine Resources**, United Nations Environment Programme 2002, available at: **http://www.unep.org/vitalwater/**



from the U.S.G.S. Ground Water Atlas, available on the website: **http://capp.water.usgs.gov/gwa/ch_I/L-text4.html**

Cap It Wins Second National Award

Cap It, the James City Service Authority's (JCSA) private well abandonment program, continues to garner regional and national recognition. In 2002, its first year of operation, *Cap It* received the EPA Region III's 2002 Source Water Protection Award. In 2003 *Cap It* received the National Association of Counties (NACO) Best of Category (Rural) Award in the Environmental Protection and Energy category. Also in 2003, James City County awarded an Outstanding Service Award to Lisa Meddin, the JCSA Water Conservation Coordinator, for her work with *Cap It*. The goals of *Cap It* are to:

- Protect the County's ground water resources from pollutants and contamination via old, unused and/or improperly abandoned private wells.
- Protect the Chesapeake Bay, local rivers and watersheds by reducing the threat of ground water contamination.
- Reduce the threat to humans and animals that may become trapped in an old well.

With $20,000 from the JCSA and $15,000 from a 106 Ground water Protection Grant from the Virginia Department of Environmental Quality, *Cap It* abandoned forty-three residential wells in 2003. Since its launch in 2002, *Cap It* has abandoned a total of ninety-six residential wells. This represents approximately 25% of the estimated non-abandoned wells in the County.

Of the forty-three wells abandoned this year, eleven are drilled wells reaching the Chickahominy Piney-Point Aquifer, the County's primary source of drinking water. The rest are shallow bored wells drawing from the water table aquifers that many residents in rural parts of the County still rely on for drinking water.

Working in partnership with James City County's Housing and Community Development Division, *Cap It* will also abandon the wells of citizens whose wells went dry during the drought of 2003 and who qualify for new wells under the State's drought assistance program.

The JCSA will continue the *Cap It* program indefinitely, with the goal of abandoning every old, unused, or improperly abandoned well in James City County.

For more information contact Larry Foster at 757-253-6806 or *lmfoster@james-city.va.us*

***Cap It* Totals**	**Year One**	**Year Two**	**Total**
2" Wells Abandoned	8	7	15
4" Wells Abandoned	5	4	9
30" Wells Abandoned	40	32	72
Total No. Wells Abandoned	53	43	96

The lesson "Common Water" examines the threat to ground water quality and quantity when multiple users fail to consider one another's needs. See the article on page 4.

*Continued from **VWRRC** page 12*

The Water Center's Tamim Younos, Interim Director, is this year's conference program chair for the joint 2003 UCOWR/NIWR/EWRI Annual Conference on "Water Security in the 21st Century." The conference will be in Washington, D.C. on July 30-August 1, 2003.

The Virginia Tech campus will be the site for the Water Center's Annual Water Research Symposium. This year, the symposium will take place at the Donaldson Brown Hotel and Conference Center on October 8-10, 2003. Information about the symposium can be found on the Water Center website: www.vwrrc.vt.edu or contact Jane Walker at *janewalk@vt.edu*

For more information contact Judy Poff at 540-231-8030 or *jupoff@vt.edu*

VWRA Source Water Update

This year has been a very rewarding year for the Virginia Rural Water Association (VWRA) Source Water program. This year VWRA has undertaken the task of completing three source water plans with the Town of Broadway plan being the focus of this article. VWRA entered into an agreement with Broadway earlier in the year to complete a source water protection plan for the town. Upon entering the agreement, VRWA associates began researching the geology and geography of the area and upon the evaluation of the area,VWRA discovered that the system lies within karst or carbonate geology. Virginia Rural Water Source Water Specialists went on site to examine the water source for the town and to get a better feel of the environment and area the Specialists would be working. Within the area there is a spring that is producing between 9 and 13 million gallons per day and this is the area in which the Association decided to concentrate its efforts.

VRWA Source Water Specialists were able to acquire funds to perform dye testing within the spring boundaries, and are still in the early stages of planning the procedures and locating areas where the dye will be injected. Thus far, VWRA Specialists have been meeting with water personnel, reviewing maps, and forming a schedule of events.

This year has been very exciting, and VWRA is looking forward to working with the Town of Broadway as well as other plans currently in the works. VWRA is anxiously anticipating the dye testing and seeing the completion of the source water plan for the Broadway water system.

For more information, contact Eric Shortt at *e_shortt@hotmail.com* or (540) 261-7178.

Students examine soil properties to understand porosity and permeability at the 2002 Ground Water Festival.

Web Viewable Online Documents

- **http://www.dnr.state.wi.us/org/water/dwg/gw/Webview.HTM**
- **www.ec.gc.ca/water/en/info/pubs/FS/e_FSA5.htm** - *Ground Water – Nature's Hidden Treasure*. (Excellent overview of ground water systems).
- **www.county.oxford.on.ca/groundwater/** - A website about ground water protection.
- **http://wdl.water.ca.gov/gw/admin/main_menu_gw.asp** - ground water level data in California, USA.
- **http://www.epa.gov/safewater/** - The Environmental Protection Agency's website on ground water
- **www.irc.nl/products/advocacy/wwd/wwd99saf.html** - Ground water in South Africa: a policy statement.
- **www.irc.nl/products/advocacy/wwd/wwd98.html, www.worldwaterday.org** - *Groundwater: An Invisible Resource* (World Water Day, 1998), plus key ground water information and the effect of falling water tables.
- **http://www.ngwa.org/** - Website of the National Ground Water Association
- **http://www.agwt.org/index.htm** - Website of the American Ground Water Trust

New Publications

- Alley, W.M., T.E. Reilly, and O.L. Franke. **Sustainability of Ground-Water Resources**: U.S.G.S. Circular 1186 (http://water.usgs.gov/pubs/circ/circ1186/)
- Focazio, M. J., T.E. Reilly, M.G. Rupert, D.R. Helsel. **Assessing Ground-Water Vulnerability to Contamination: Providing Scientifically Defensible Information for Decision Makers:** U.S.G.S. Circular 1224
- Krapac, I.G., W.S. Dey, W.R. Roy, C.A. Smyth, E. Storment, S.L. Sargent and J.D. Steele, 2002. **Impacts of Swine Manure Pits on Groundwater Quality**, ***Environmental Pollution***, V. 120(2), pgs. 475-492
- Smith, B.S., and Harlow, G.E., Jr., 2002. **Conceptual Hydrogeologic Framework of the Shallow Aquifer System at Virginia Beach, Virginia**: USGS: Water-Resources Investigations Report 01-4262, pg. 32 http://va.water.usgs.gov/online_pubs/WRIR/01-4262.pdf
- Winter, T.C., J.W. Harvey, O.L. Franke, and W.M. Alley. **Ground Water and Surface Water A Single Resource**: U.S.G.S. Circular 1139
- **Groundwater and its susceptibility to degradation:** ***A global assessment of the problem and options for management:*** United Nations 2002 publication found at: http://www.unep.org/dewa/water/groundwater/groundwater_report.asp
- **Vital Water Graphics: An Overview of the World's Fresh and Marine Resources**, United Nations Environment Programme 2002 publication found at: http://www.unep.org/vitalwater/

Funding for the Virginia Ground Water Protection Steering Committee activities, including development of this Report, is provided through a grant to the Department of Environmental Quality by the US Environmental Protection Agency